Prompt Problems: A New Programming Exercise for the Generative AI Era

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Abstract

Large language models (LLMs) are revolutionizing the field of computing education with their powerful code-generating capabilities. Traditional pedagogical practices have focused on code writing tasks, but there is now a shift in importance towards reading, comprehending and evaluating LLM-generated code. Alongside this shift, an important new skill is emerging -- the ability to solve programming tasks by constructing good prompts for code-generating models. In this work we introduce a new type of programming exercise to hone this nascent skill: 'Prompt Problems'. Prompt Problems are designed to help students learn how to write effective prompts for AI code generators. A student solves a Prompt Problem by crafting a natural language prompt which, when provided as input to an LLM, outputs code that successfully solves a specified programming task. We also present a new web-based tool called Promptly which hosts a repository of Prompt Problems and supports the automated evaluation of prompt-generated code. We deploy Promptly in one CS1 and one CS2 course and describe our experiences, which include student perceptions of this new type of activity and their interactions with the tool. We find that students are enthusiastic about Prompt Problems, and appreciate how the problems engage their computational thinking skills and expose them to new programming constructs. We discuss ideas for the future development of new variations of Prompt Problems, and the need to carefully study their integration into classroom practice.